Process by Which General Variance Treatment Requirements Can be Reviewed at Each Triennial Review

1. At this triennial review, do enough facilities in the category pass the Significant P (or N) Test to warrant moving to the Economic Impact Test?

YES **NO**

Done. Continue collecting data in preparation for next triennial review

2. Carry out Economic Impact Test. Determine upgrade cost for each facility relative to the community's MHI. Then, determine the <u>median</u> cost increase (as % MHI) for <u>the group of facilities</u> in the category. Is the median cost > **X** % MHI?

NO **YES**

3. For the category, DEQ updates the General Variance treatment requirement to the next level. The updated General Variance concentrations will be considered in each facility's next permit re-issuance. Facilities in the category will need to either (1) meet the nutrient standard(s), (2) meet the new General Variance requirements, (3) get a compliance schedule to meet 1 or 2 above, or (4) apply for an Individual Variance if the new General Variance requirements are too costly

Done. At this point in time the cost to upgrade, in aggregate, is still too high to warrant lowering the category's General Variance concentrations

1.0 The *Significant Nitrogen and Phosphorus Test* and the *Economic Impact Test*, Using the '>1 MGD' Category as an Example

Various steps are required to complete both the Significant Nitrogen and Phosphorus Test and the Economic Impact Test. Each test also comes with its own data requirements. These are detailed below.

1.1. The Significant N or P (Nutrient) Test

Questions: For Dischargers > 1 MGD, would moving up one level of treatment (starting from WERF level 2, i.e. 10 mg TN/L and 1 mg TP/L; Falk et al., 2011) result in a significant reduction (**X** percent) in TN or TP load at the end of a facility's mixing zone during the period when the nutrient standards apply? Would the upgrade result in meeting the nutrient standard(s) at the end of the mixing zone?

Sampling Frame: All wastewater facilities >1 MGD (and their associated receiving streams) as long as they are currently discharging at concentrations higher than (worse than) WERF level 3[1], which is 5 mg TN/L and 0.2 mg TP/L. There are currently about 28 facilities in the category (12 public, 16 private), but only 17 of them currently have discharge concentrations higher than WERF level 3 (Blend and Suplee, 2012; DEQ, 2012).

Methods: Every 3 years (triennial review), starting in 2016, analyze all dischargers in the sampling frame (or a random sub-sample if the work load is too great, but this is not likely). Calculate the end-of-mixing zone TN and TP concentrations resulting from the mixing of a facility's summer effluent plus ambient upstream nutrient concentrations in the receiving stream, using an assumed flow at the seasonal 14Q10[2]. Do this again, using the same ambient concentration data and the seasonal 14Q10 flow, but use effluent data at WERF level 3 concentrations (or 3 to 4, if the categorical upgrade from 2 to 3 has already occurred). Determine current and projected nutrient loads, and calculate the test metric 'Reduction in Load from Upgrade as a % of Total Existing Load, Adjusted for Community-funded Trades'. See **Table 1-1** below for an example.

[1] Only facilities discharging at concentrations higher than WERF level 3 (5 mg TN/L and 0.2 mg TP/L) would be included because the General Variance for the >1 MGD category is currently at level 2 (10 mg TN/L and 1 mg TP/L).
[2] This process may also require that we define how to characterize the ambient nutrient-concentration data upstream of the facilities that has been collected over the previous years. Options included the 75^{th} percentile of the data, the mean, the median, etc.

Table 1-1. At a Dilution Ratio of 100:1, a Hypothetical Determination of Concentration and Load (After the Mixing Zone), and Derivation of the Test Metric. Example shown here is for total nitrogen. Instream flow used for calculation is the seasonal 14Q10.

			Projected Conc.		Projected Load	Projected Reduction		Test Metric
Year	Stream background Conc. (mg TN/L)	Instream concentration after mixing, at current facility discharge of 10 mg TN/L (mg/L)	Instream concentration after mixing, at facility discharge upgraded to 5 mg TN/L (mg/L)	Total load after mixing, at facility discharge of 10 mg TN/L (kg/day)	Total load after mixing, at facility discharge upgraded to 5 mg TN/L (kg/day)	Load reduction from projected upgrade as a percent of total current load	Credit for Load Traded by Facility† (kg/day)	Load reduction from projected upgrade as a percent of total current load, adjusted for facility-funded trades
2012	0.500	0.59	0.54	2700	2475	8%	0	**8%**
2013	0.480	0.57	0.52	2610	2385	9%	0	**9%**
2014	0.450	0.54	0.50	2475	2250	9%	0	**9%**
2015	0.380	0.48	0.43	2160	1935	10%	0	**10%**
2016*	0.350	0.45	0.40	2025	1800	11%	0	**11%**
2017	0.320	0.42	0.37	1890	1665	12%	100	**7%**
2018	0.300	0.40	0.35	1800	1575	13%	100	**7%**
2019*	0.270	0.37	0.32	1665	1440	14%	100	**8%**
Average (5-year rolling, 2012-2016) :			**0.48**			10%	0	**10%**
Average (5 year rolling, 2015-2019) :			**0.37**			12%	60	**9%**

* Triennial review.

† Mass credited accounting for trade ratios. For example, if the trade requires that 2 kg nitrogen must be reduced for each 1 kg credited, and an estimated 200 kg will be reduced, the community will receive credit here for 100 kg.

Table 1-2. At a Dilution Ratio of 5:1, a Hypothetical Determination of Concentration and Load (After the Mixing Zone), and Derivation of the Test Metric. Example shown here is for total nitrogen. Instream flow used for calculation is the seasonal 14Q10.

			Projected Conc.		Projected Load	Projected Reduction		Test Metric
Year	Stream background Conc. (mg TN/L)	Instream concentration after mixing, at current facility discharge of 10 mg TN/L (mg/L)	Instream concentration after mixing, at facility discharge upgraded to 5 mg TN/L (mg/L)	Total load after mixing, at facility discharge of 10 mg TN/L (kg/day)	Total load after mixing, at facility discharge upgraded to 5 mg TN/L (kg/day)	Load reduction from projected upgrade as a percent of total current load	Credit for Load Traded by Facility† (kg/day)	Load reduction from projected upgrade as a percent of total current load, adjusted for facility-funded trades
2012	0.50	2.08	1.25	1125	675	40%	0	**40%**
2013	0.32	1.93	1.10	1044	594	43%	0	**43%**
2014	0.28	1.90	1.07	1026	576	44%	0	**44%**
2015	0.25	1.88	1.04	1013	563	44%	0	**44%**
2016*	0.206	1.84	1.01	993	543	45%	0	**45%**
2017	0.190	1.83	0.99	986	536	46%	100	**36%**
2018	0.106	1.76	0.92	948	498	47%	100	**37%**
2019*	0.104	1.75	0.92	947	497	48%	100	**37%**
Average (5-year rolling, 2012-2016) :			**1.09**			43%	0	**43%**
Average (5 year rolling, 2015-2019) :			**0.98**			46%	60	**40%**

* Triennial review.

† Mass credited accounting for trade ratios. For example, if the trade requires that 2 kg nitrogen must be reduced for each 1 kg credited, and an estimated 200 kg will be reduced, the community will receive credit here for 100 kg.

<u>Data Requirements</u>: DEQ will need <u>at a minimum</u>:

1. Monthly effluent data in summer for TN and TP concentration for each facility (THIS WILL HAVE TO BE COLLECTED VOLUNTARILY BY THE FACILITIES AT LEAST UNTIL REQUIRED BY PERMITTING)

2. Monthly ambient background TN and TP concentration of the receiving stream upstream of the facility during the period when the nutrient standards apply (THIS WILL HAVE TO BE COLLECTED VOLUNTARILY BY THE FACILITIES)

If data collection began 2012, 5 years of data would be available by 2016.

<u>Decision Framework for the Significant Nutrient Tests</u>: Calculate the rolling average for the past 5 (or 3) years for the Test Metric (last column in **Tables 1-1, 1-2**) and compare each facility's result to the threshold established by the NWG and DEQ. Also determine if, based on last 5 (or 3) years' data, the hypothetical upgrade would have resulted in meeting the nutrient standard <u>concentration</u> at the end-of-mixing zone. Also determine if the nutrient standard will be met without any major upgrade. Then use these decision rules:

Table 1-3. Decision Rules for Evaluating Results from Significant Nutrient Tests for a Single Facility*.

Is Projected Load Reduction ≥Threshold? (y/n)	Would Projected Upgrade Result in Meeting the Standard Beyond the Mixing Zone? (y/n)	Conclusion
NO	NO	Do Not Carry out Economic Impact Test
NO	YES	Carry Out Economic Impact Test
YES	NO	Carry Out Economic Impact Test
YES	YES	Carry Out Economic Impact Test

*In any scenario where the nutrient standard can be met based on the previous 3-5 year rolling average **without** the upgrade to the facility, the Conclusion would be "Do Not Carry Out Economic Test".

Determine the number of facilities for which the conclusion from **Table 1-3** is 'Carry Out Economic Test'. **If there are enough cases (>50%? >30%?) in the category for which the finding is 'Carry Out Econonic Impact Test', move to the Economic Impact Test.**

1.2 Economic Impact Test

Determine the ***estimated*** cost to upgrade each facility and express the cost/new rates as a % MHI. If the median of the cost estimate <u>for the category</u> exceeds the MHI threshold agreed upon by DEQ/NWG, no rule change is warranted. If the median cost to upgrade is ≤ the threshold, a move to the next WERF treatment level is warranted <u>for the category</u> and the General Variance concentrations for the category will be lowered in DEQ rule.

(Although there are about 16 private MPDES permit holders > 1MGD, there is not straight-forward way to determine what is too expensive for these private facilities; so, DEQ would have to base its economic decision more on the public facilities. By law, DEQ will need to discuss the General Variance

change with the NWG anyway, so a venue will be open for the private-sector dischargers to provide thier feedback. Individual Variances are always available.)

<u>Example</u>. Assume the significant load reduction threshold is 10%. For the facilities in **Tables 1-1, 1-2**:

<u>2016 Triennial Review</u>:

Facility 1 (100:1 dilution): 'YES' 'NO': Carry out Economic Impact Test

Facility 2 (5:1 dilution): 'YES' 'NO': Carry out Economic Impact Test

Same process is carried out for each applicable facility in the category. If only 2 of the 17 facilities show 'Carry out Economic impact Test', testing would likely stop here and no change to the General Variance treatment requirements would occur. Continue data collection.

<u>2019 Triennial Review (facility in Table 1-1 has undertaken some trades</u>):

Facility 1 (100:1 dilution): 'NO' 'NO': Do <u>not</u> carry out Economic Impact Test

Facility 2 (5:1 dilution): 'YES' 'NO': Carry out Economic Impact Test

Same process is carried out for each applicable facility in the category. If enough streams/rivers would benefit from upgrading to the next WERF level, carry out the Economic Impact Test. If the Economic Impact Test indicates that the categorical upgrade is, in aggregate, affordable, the General Variance concentrations would be changed in rule. (If not, no change.) For the hypothetical facility in **Table 1-1**, they should come very close to meeting the TN standard at 14Q10 flows after the upgrade, because the scenarios were carried out under an assumption of an equivalent low flow. This should mesh well with the permit conditions.

2.0 <1 MGD Category and the Lagoon Category

The process outlined above could easily be carried out for the <1 MGD category, using an upgrade from current General Variance levels (2 mg TP/L and 15 mg TN/L minimum) to WERF level 2 (~ 10 mg TN/L, 1 mg TP/L). It might even be feasible to consider going from current levels to level 3. DEQ would need effluent data and upstream nutrient concentration data to carry out the analysis, and would need it for all dischargers in the < 1 MGD category.

The process described in **Section 1.0** is not feasible for the Lagoon category because the leap from lagoon to mechanical facility is too large for the vast majority of small communities. The lagoon category will likely have to wait for a significant lagoon-based technological innovation to warrant a change.

3.0 Complicating Issues to be Considered

1. What if the test is significant for TN or TP but not the other? WERF treats N and P upgrades as if they are locked together. But could a WERF level 2 facility be outfitted to meet much lower TP concentrations without moving the entire facility to level 3? If so, this process could update the General Variance P concentration independently from the N concentrations.

2. These analyses should be done for <1MGD facilities too.

3. If only a few facilities in a category collect upstream water quality data voluntarily, results of the testing procedures outlined above will be biased.

4. This process needs to have an override clause to cover the situation where a new technology that is low-cost comes along that supplants the WERF levels considered here. Or, it may dovetail well into this process. For example, DEQ could look at implementing the new technology, run he tests, and estimate the cost (it is assumed here that some type of cost estimate to implement the new technology could be undertaken). If it's truly a low-cost technological breakthrough, it should both improve water quality and not be too expensive.

4.0 References

Blend, J., and M. Suplee, 2012. Demonstration of Substantial and Widespread Economic Impacts to Montana that Would Result if Base Numeric Nutrient Standards had to be Met in 2011/2012. Helena, MT: Montana Dept. of Environmental Quality.

DEQ (Department of Environmental Quality), 2012. Demonstration of Substantial and Widespread Economic Impacts to Montana that Would Result if Base Numeric Nutrient Standards had to be Met by Entities in the Private Sector in 2011/2012. *Draft.* Helena, MT: Montana Dept. of Environmental Quality.

Falk, M.W., J.B. Neethling, and D.J. Reardon, 2011. Striking a Balance Between Wastewater Treatment Nutrient Removal and Sustainability. Water Environment Research Foundation, Document No. NUTR106n.